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REPORT NO. 11-91

PROLONGED TREADMILL LOAD CARRIAGE: ACUTE INJURIES AND CHANGES IN FOOT ANTHROPOMETRY

U S ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE

Natick, Massachusetts

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PROLONGED TREADMILL LOAD CARRIAGE: ACUTE INJURIES AND CHANGES IN FOOT ANTHROPOMETRY

Katy L. Reynolds,MAJ, MC

SPC John Kaszuba

Robert P. Mello, M.A.

John F. Patton, Ph.D.

Occupational Health and Performance Directorate

US Army Research Institute of Environmental Medicine

Natick, Massachusetts 01760-5007

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The objectives of this study were to: 1) determine the distribution of injuries occurring during loaded treadmill marching, 2) determine if there are significant anthropometric changes that occur in the foot during this marching, and 3) identify variables (speed, load) that may affect these injuries and foot changes. Fifteen male subjects marched on a level treadmill at three speeds (3.96, 4.86, 5.76 km/hr), and with each of three loads (5.2, 31.5, 49.4 kg), in random order over a 7 week period. The march distance was 12 km and the Army's external frame pack system (Alice) was used. Aerobic power (maximum oxygen uptake) and body composition (body density by underwater weighing) were measured during the initial week. During the next 7 weeks foot anthropometric measurements were obtained before and after each treadmill march. A physician was present to record all injuries that occurred during each march. This study documented a large number of minor injuries (N=82) among physically fit soldiers marching on a treadmill at fast speeds and over a long distance with heavy loads. Significant pre to post foot anthropometric changes ($P<.05$) were observed in the ball of

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Katy L. Reynolds

22b. TELEPHONE *(Include Area Code)*
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foot and instep circumferences with a tendency for these changes to occur with the heavier loads while ankle circumference changes occurred throughout most of the conditions. The results of this study indicate that: 1) load carriage injuries occurring during a prolonged treadmill march primarily involve the lower extremities and back, 2) foot blisters were the most common injury recorded, 3) the standard Army practice of using foot powder and undergoing frequent sock changes does not prevent blister formation during prolonged treadmill marches, 4) the most common types of back injury was upper back strain, and 5) transient rucksack palsy can occur when carrying a heavy load on a treadmill for an extended period of time, 6) marching on a treadmill over a prolonged period will significantly increase the circumference of the foot, and 7) treadmill load carriage march injuries are similar to actual field loaded road march injuries.

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FOREWORD

Technology has changed many aspects of the US Army. Nevertheless, the Light Infantryman continues to rely on his own mobility in the battlefield. The soldier must transport his own equipment and be self-sustained for a period of several days until resupply is provided. Thus, it is important to understand the factors and problems related to the individual soldier's mobility, particularly over long distances and with heavy loads.

The Army recently created four new "light" infantry divisions. Loaded road march missions and training are common features in these divisions. The greater emphasis on loaded road march training has led to a resurgence of musculoskeletal injuries. These injuries are a major cost to the military in terms of lost manpower and health care cost (1). In the few studies which have systematically collected load carriage injury data, foot blisters appear to be the predominant injury (2,3,4). Other injuries have reported have included stress fractures (5), plantar fasciitis (2,3) and rucksack palsy (6).

In November 1988, the Surgeon General tasked the US Army Medical Research and Development Command to conduct a program of training injury research. While studying the physiology of load carriage, we availed ourselves of the opportunity to document load carriage-related injuries during prolonged walking on a motor driven treadmill. Since foot blisters are a common walking-related injury, this report also examines the foot morphometric changes that occur during loaded treadmill marching.

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EXECUTIVE SUMMARY

The purposes of this study were to: 1) determine the distribution of injuries occurring during loaded treadmill marching, 2) determine if there are any significant foot anthropometric changes that occur during this marching, and 3) identify variables (speed, load) that may affect these changes. Fifteen male subjects marched on a level treadmill at three speeds (3.96, 4.86, 5.76 km/hr) and each of three loads (5.2, 31.5, 49.4 kg). The march distance was 12 km and the Army's external frame pack system (Alice) was used. Aerobic power (maximum oxygen uptake) and body composition (body density by underwater weighing) were measured. Foot anthropometric measurements were obtained before and after each treadmill march. A physician was present to record all injuries that occurred during each march. The results of this study indicate that 1) load carriage injuries during a prolonged treadmill march primarily involve the lower extremities and back, 2) foot blisters are the most common injury, 3) the standard Army practice of using foot powder and undergoing frequent sock changes does not prevent blister formation during prolonged treadmill marches, 4) the most common type of back injury is upper back strain, 5) transient rucksack palsy can occur when carrying a heavy load on a treadmill for an extended period of time, 6) Marching on a treadmill over a prolonged period will significantly increase the circumference of the foot, and 7) treadmill loadcarriage march injuries are similar to actual field loaded road march injuries. Recommendations include 1) the standard Army practice of preparing the feet prior to a road march needs to be systematically reevaluated and updated, 2) adequate planning is necessary before participating in a prolonged loaded march and unit leaders should consider several factors (footwear, load weight and distribution, etc.) during the preparation phase, 3) the sizing of bootwear needs further evaluation to determine the relationship of these factors to the occurrence of foot blisters, and 4) anatomical and biomechanical factors play an important role in loaded marching and should be carefully considered in order to prevent injuries.

INTRODUCTION

Load carriage is a vital part of military operations among the light infantry. Despite technical advances, the infantry soldier must in many cases depend on his own mobility to move himself and his equipment during combat. In certain field operations, an individual soldier may have to carry an amount of ammunition and equipment approaching his own body weight. This may lead to excessive fatigue and injuries as was experienced among the U.S. Army in Grenada (7). There is very little reliable data available on injuries occurring during prolonged load carriage marches. In a study conducted in Sweden (2), as many as 90% of the 114 infantry soldiers required medical attention for injuries encountered during a 20-26 km loaded roadmarch. In a recent US Army infantry exercise, Knapik et al, (3) reported that 24% of his subjects had one or more injuries while performing a maximal effort 20km road march and carrying a 46 kg load.

Foot blisters are the most common injuries reported (2,3,4) during load carriage marches. Cooper (4) related the incidence of blistering to increases in foot girth occurring during loaded road marching. However, there is very little information available on foot anthropometry and loaded road marching (8).

Other common injuries associated with load carriage include upper and lower back strain, metatarsalgia, plantar fasciitis, knee and ankle pain (2,3), stress fractures (5) and rucksack palsy (6). These injuries can debilitate the soldier and lead to lost mission effectiveness, training time, and ultimately his combat readiness.

The objectives of this study were three-fold, 1) to determine the distribution of injuries occurring during loaded treadmill marching, 2) to determine if there are significant anthropometric changes that occur during this marching, and 3) identify variables (speed, load) that may affect these injuries and foot changes.

METHODS

Subjects. Fifteen male soldiers were recruited after completing either advanced individual training at Ft. Jackson or one-station unit training at Ft. Benning. All subjects were briefed about the study and signed a Volunteer Agreement Affidavit according to Army Regulations 70-25 and 40-38 prior to participation in the study. They then were evaluated by a physician

for medical clearance to participate as test subjects.

Design. During the initial week the subjects became acquainted with the laboratory procedures, and practiced walking on the treadmill at the various speeds and loads defined for the study. Body composition (body density by underwater weighing) and aerobic power (maximal oxygen uptake) were also measured during this period (9).

Over a 7 week period, the subjects performed 9 randomly ordered load carriage trials at 0% grade on a treadmill (Quinton Model 24-72). The loads and speeds are displayed in Table 1.

TABLE 1. Load carriage conditions

Condition	Load(kg)	Speed(km/hr)
1	5.2	3.96
2	5.2	4.86
3	5.2	5.76
4	31.5	3.96
5	31.5	4.86
6	31.5	5.76
7	49.4	3.96
8	49.4	4.86
9	49.4	5.76

The 5.2 kg load consisted of the standard battle dress uniform, standard black leather combat boots, and kevlar helmet. For the 31.5 kg and 49.4 kg loads, 13.6 and 31.5 kg, respectively, were carried in an all-purpose, lightweight, individual carrying equipment (ALICE) system. The rest of the weight (17.9 kg) consisted of 12.7 kg distributed on the equipment belt and the 5.2 kg as described above.

The trials were randomly arranged for each subject to minimize any training effects. Each subject performed no more than two trials per week, with each trial being separated by at least two days. The distance was fixed at 12 km for each march trial. A 10 min rest period was taken each hour. The total time for each trial (including rest periods) varied according to the speed: 3.96 km/hr (212 min), 4.86 km/hr (168 min), 5.76 km/hr (145 min).

The subjects were interviewed and examined by a physician at the beginning and end of each treadmill march to learn of any injuries that may have resulted from the march. The physician then recorded findings on an injury record form (Appendix). An injury was defined as any untoward event that occurred during testing which led to an impairment of body function or structure.

The subjects were given clean socks and foot powder was applied to their feet on a daily basis to minimize blistering. All subjects wore the standard plastic mesh ventilating insert normally supplied with the boots.

Foot Anthropometric Measurements. Five measurements were made on the bare right foot before and after the treadmill marches according to the procedures of White (10). The subject remained standing with a load in an erect stance on a platform. The feet were positioned slightly apart so that the subject's weight was evenly distributed. The Martin sliding caliper was utilized to determine the ball of foot (BOF) breadth and heel breadth. The first and fifth metatarsophalangeal joints were used as landmarks for measuring ball of foot breadth. The heel breadth measurements used the base of the Achilles tendon and the posterior aspects of the malleoli as landmarks.

The Gulich tape measure was used to measure the ball of foot (BOF), instep and ankle circumferences. The ball of foot circumference was determined by placing the tape over the first and fifth metatarsophalangeal joints. The instep circumference was measured by placing the tape measure at the highest point of the medial aspect of the arch of the foot and bringing it around the dorsum of the foot to the lateral aspect of the arch. The ankle circumference was determined by using the medial and lateral malleoli as the landmarks (Fig 1).

All measurements were performed twice, averaged, and recorded in millimeters.

Statistical Analysis. A one-way analysis of variance with repeated measures was used to determine pre to post changes of foot anthropometric measurements at each load condition. A two-way analysis of variance with repeated measures was also performed to find out if there were significant differences in foot girth pre to post test and if these differences were affected by load or speed. An alpha level of 0.05 was used to indicate statistical significance.

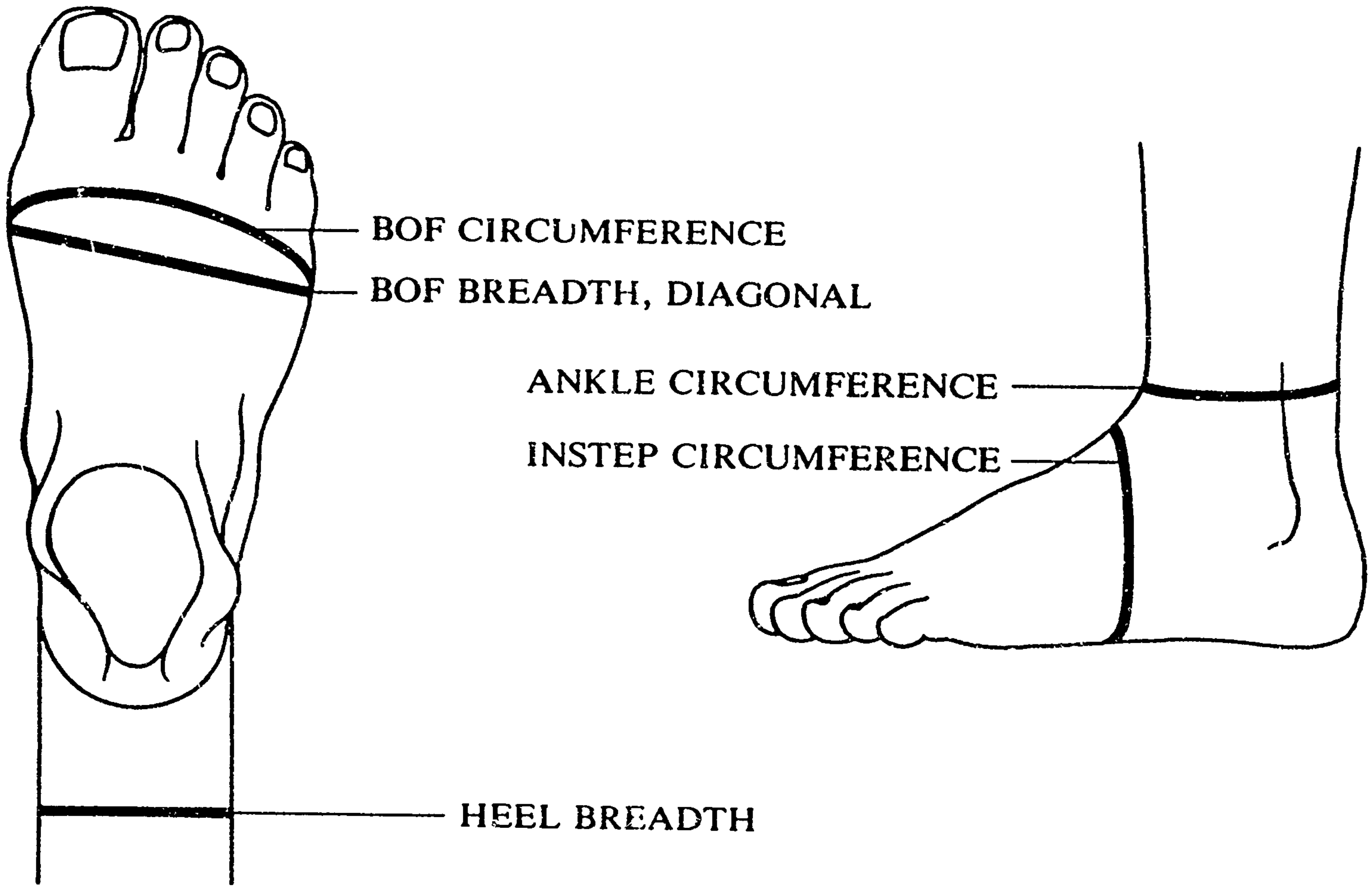

Figure 1. Foot anthropometric measurements.

RESULTS

The subject descriptive characteristics were (mean ± SD): age, 21.1 ± 1.0 yrs; body mass, 77.1 ± 28 kg; height, 173.9 ± 1.9 cm; percent body fat, 17.4 ± 0.8 %; and maximal oxygen uptake ($\dot{V}o_2max$), 58.5 ± 1.5 ml·kg^{-1}·min^{-1}. When compared to other Army populations, the mean (±SD) for percent body fat was similar (11) but the $\dot{V}o_2max$ was slightly higher than the average soldier completing advanced training (12).

Figures 2-6 describe foot anthropometric changes at the various speeds and loads. No pre to post changes were noted with ball of foot breadth (diagonal) for any condition. Significant changes were noted in the ball of foot circumference with combinations of 1) a light load at a fast speed, 2) a medium load at a medium speed, and 3) a heavy load at a slow speed. Instep circumference changes were significant with the medium and heavy loads at both slow, medium and fast speeds. Heel breadth measurement changes were significant with the light load at both the slow and fast speeds and with the medium load at a medium pace. Ankle circumferences showed a significant increase during all load carriage conditions except for the medium load at a medium speed.

The two-way analysis of variance revealed that there were significant differences ($p < .05$) pre to post tests in all foot anthropometric measurements except for ball of foot breadth (diagonal). However, the repeated measures revealed no significant pre to post differences by load or speed.

Injuries were recorded during each load carriage condition as shown in Table 2. There were a total of 82 injuries reported and friction blisters and upper back strain accounted for more than 50% of the total.

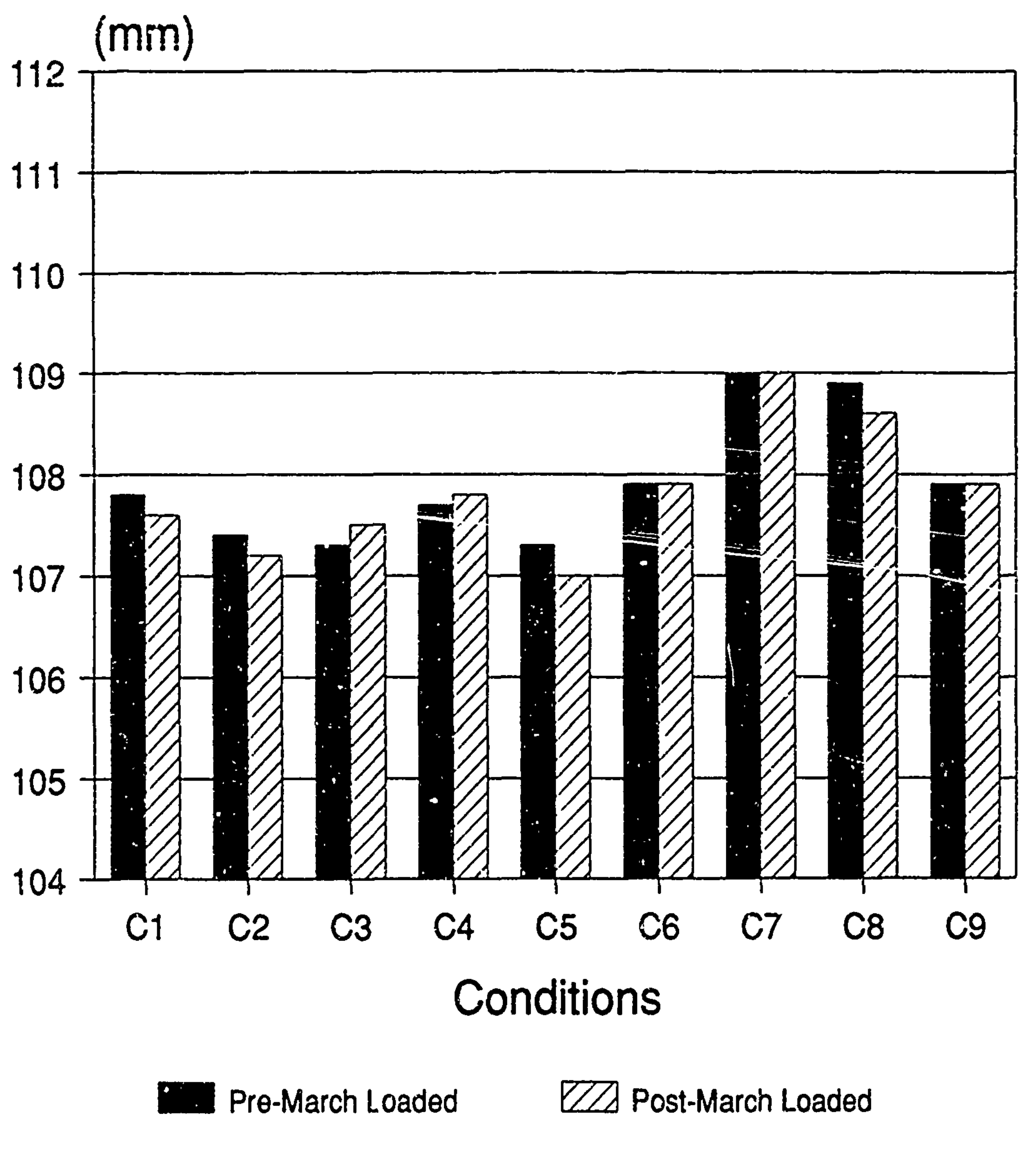

Figure 2. Mean pre and post values for ball of foot breadth for each load carriage condition. (* p<.05)

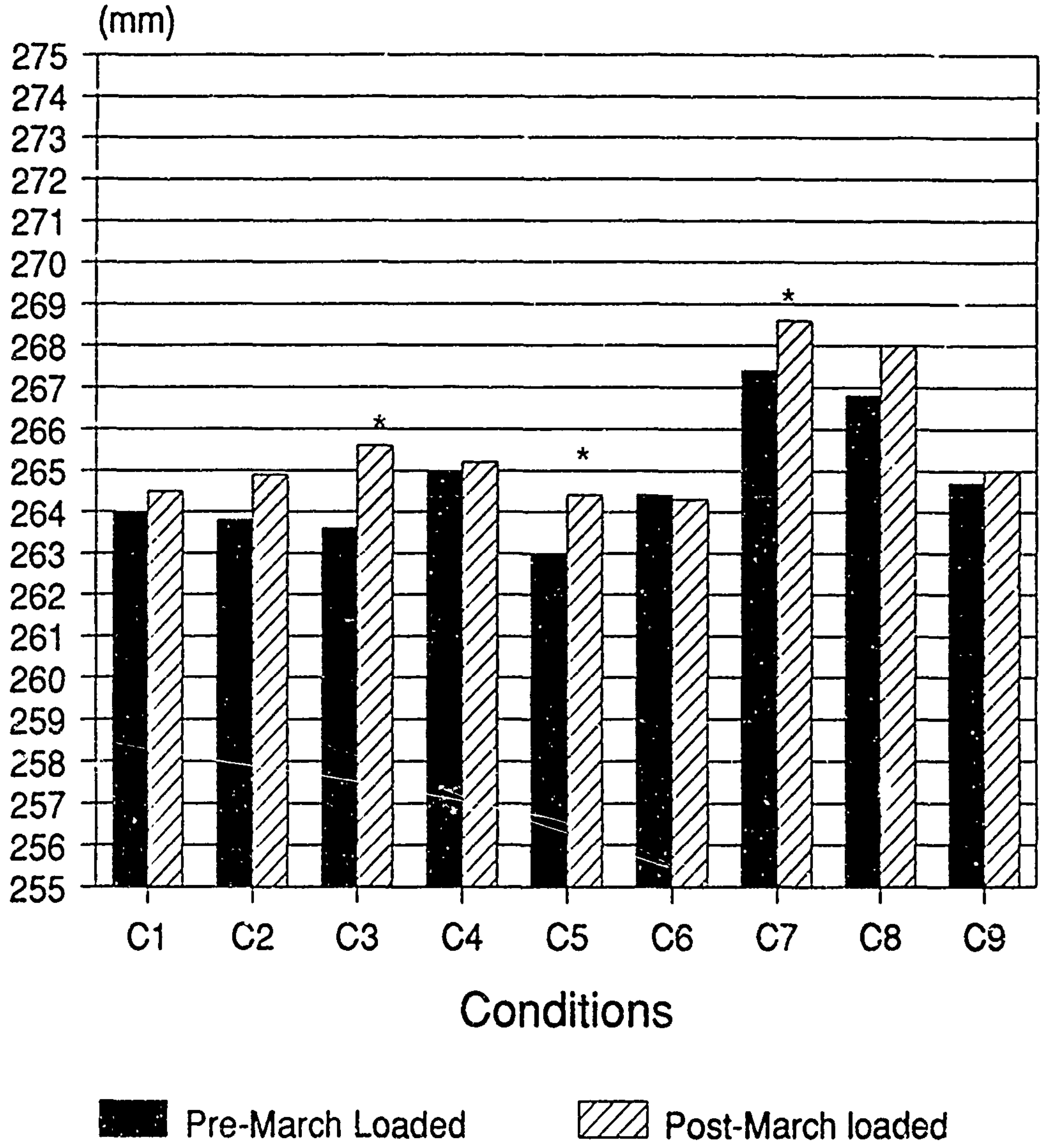

Figure 3. Mean pre and post values for ball of foot circumference for each load carriage condition. (* p<.05)

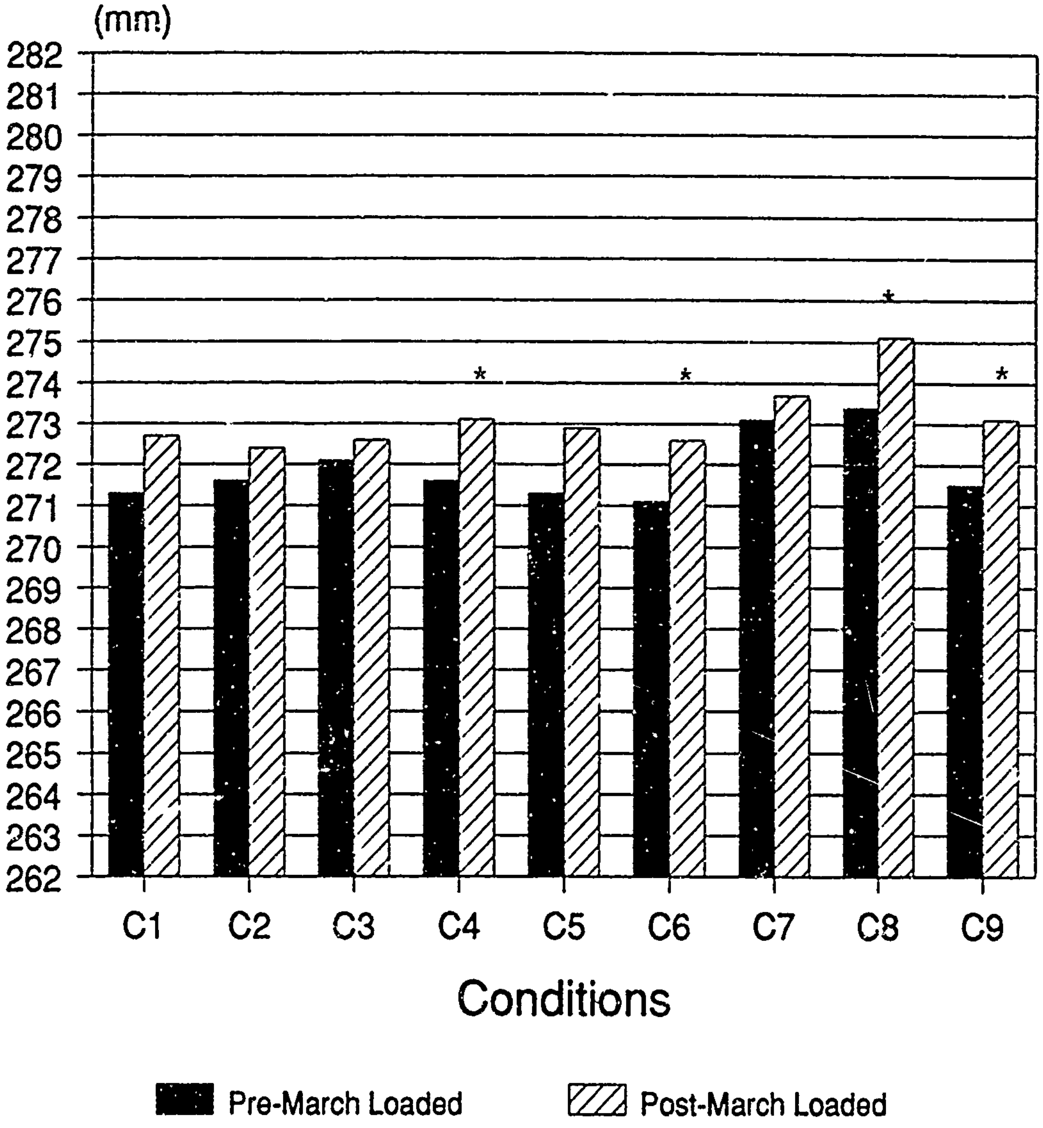

Figure 4. Mean pre and post values for instep circumference for each load carriage condition. (* p<.05)

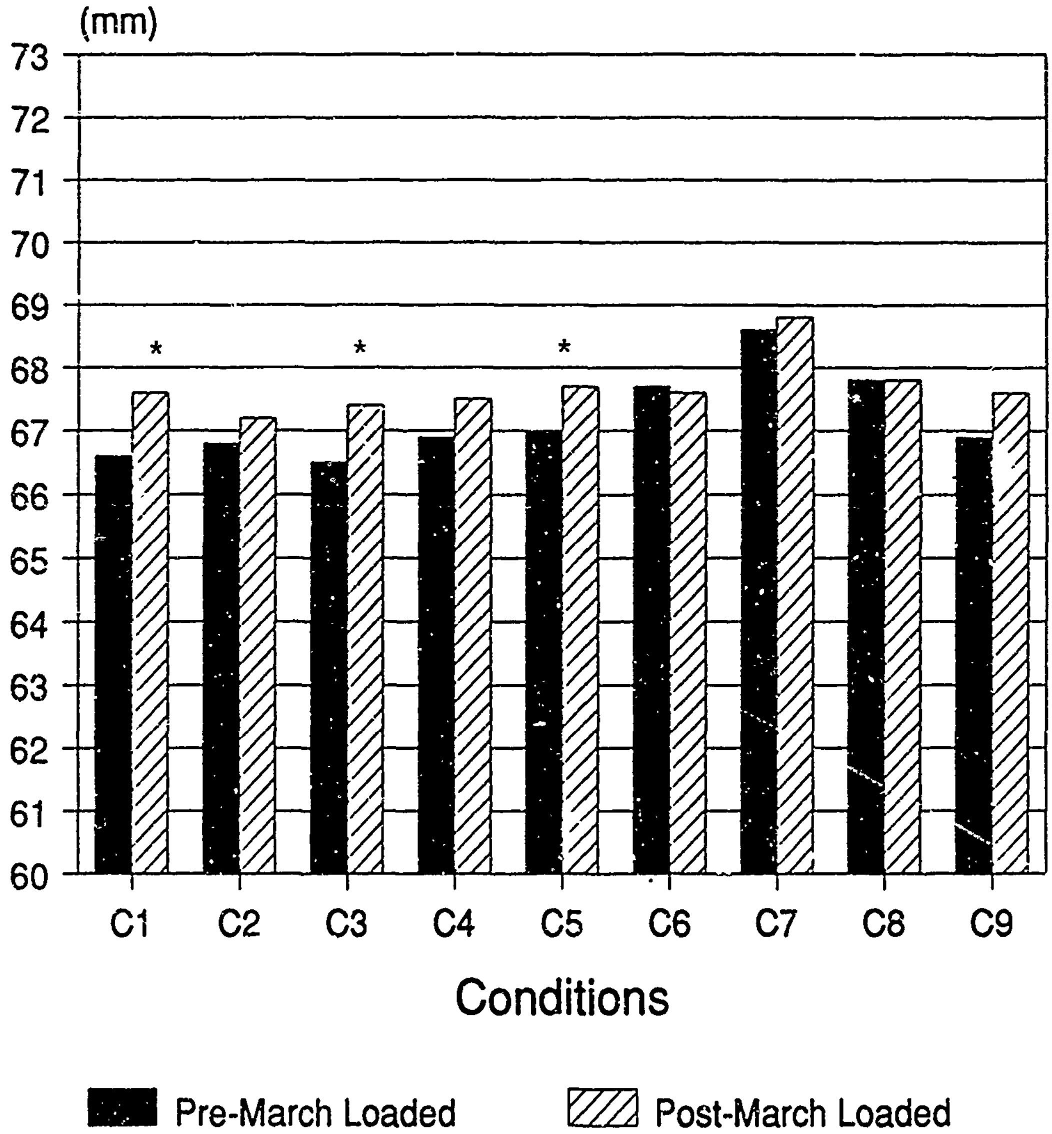

Figure 5. Mean pre and post values for heel breadth for each load carriage condition. (* $p<.05$)

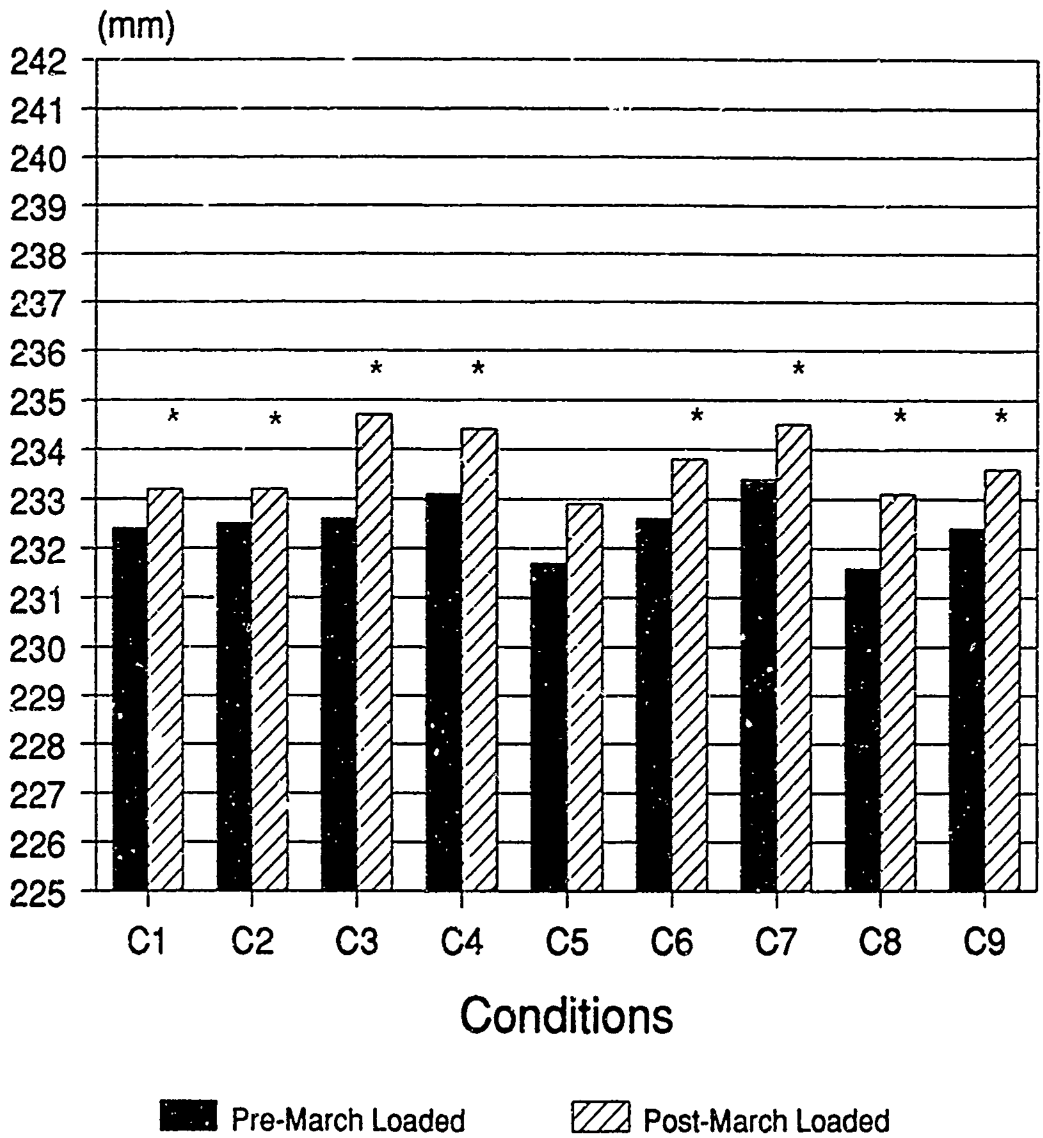

Figure 6. Mean pre and post values for ankle circumference for each load carriage condition. (* p<.05)

TABLE 2. Types of injuries for all load carriage conditions.

TYPE	NUMBER	PERCENT
Friction Blisters (feet)	24	29.4%
Upper back strain	19	23.3%
Hot Spots (feet)	10	12.2%
Shoulder numbness	2	2.5%
Shoulder tendonitis	4	4.9%
Metatarsal Pain (feet)	4	4.9%
Abrasions (shoulder/abdomen)	3	3.6%
Plantar Fasciitis (feet)	3	3.6%
Tendonitis (knee)	3	3.6%
Toenail Injury	3	3.6%
Groin Strain	2	2.5%
Low Back Strain	1	1.2%
Hip Pain	1	1.2%
Ankle Sprain	1	1.2%
Foot Contusions	1	1.2%
Metatarsal Fracture (feet)	1	1.2%
TOTAL	**82**	**100.0**

Figure 7 displays the percentage of total injuries relative to load carriage weight. Sixty-five percent (53/82) of the injuries occurred with the heaviest load.

Figure 8 shows the percentage of total injuries with respect to march rate. Forty-five percent (37/82) of the injuries occurred at the fastest speed.

Table 3 shows the location of injuries for all conditions. More than 60% of the total injuries involved the lower extremities with the feet being the most predominant body part injured. The back was the second most common injury site.

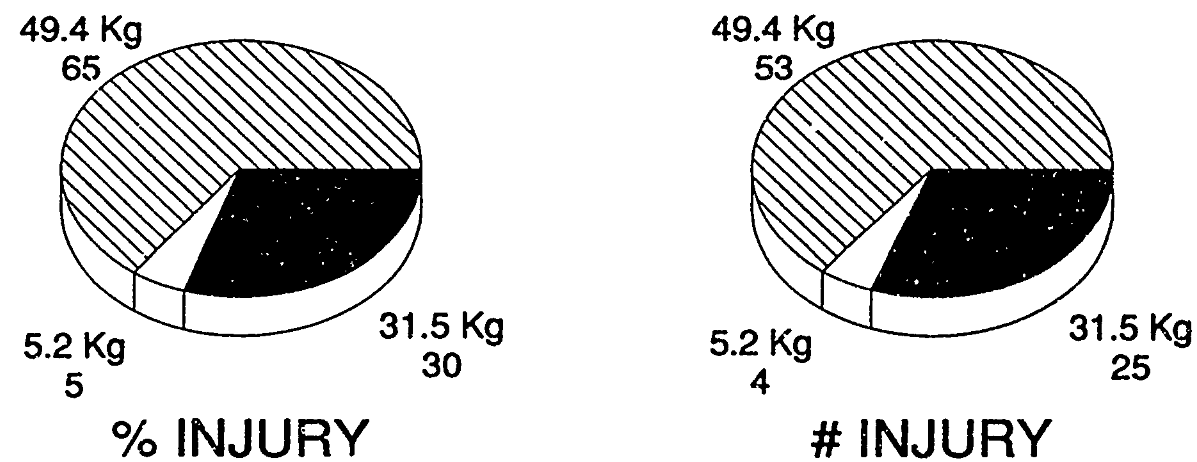

Figure 7. Total injuries relative to load carriage weight.

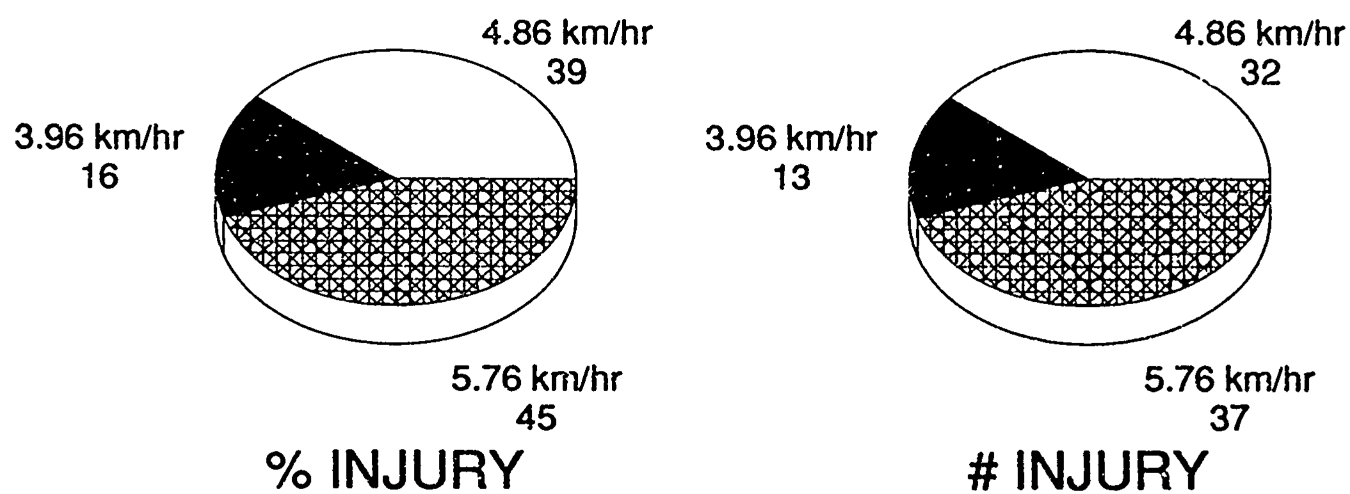

Figure 8. Total injuries relative to march rate.

TABLE 3. Location of injuries for all load carriage conditions.

LOCATION	NUMBER	PERCENT
Feet	46	56.1%
Back	20	24.5%
Shoulders	8	9.8%
Knees	3	3.6%
Groin	2	2.4%
Hips	1	1.2%
Ankle	1	1.2%
Abdomen	1	1.2%
TOTAL	**82**	**100.0**

The influence of the load carriage conditions on foot injuries is shown in Table 4. A greater percentage of the foot injuries occurred with the heaviest load at the medium and fast speeds. Carrying a medium load at both medium and fast speeds also led to frequent injuries.

TABLE 4. Influence of load carriage conditions on foot injuries.

CONDITIONS	NO.OF INJURIES	PERCENT
1. 5.2kg, 3.96 km/hr	0	0.0%
2. 5.2kg, 4.86 km/hr	1	2.2%
3. 5.2kg, 5.76 km/hr	3	6.5%
4. 31.5kg, 3.96 km/hr	3	6.5%
5. 31.5kg, 4.86 km/hr	8	17.4%
6. 31.5kg, 5.76 km/hr	6	13.1%
7. 49.4kg, 3.96 km/hr	0	0.0%
8. 49.4kg, 4.86 km/hr	10	21.7%
9. 49.4kg, 5.76 km/hr	15	32.6%
TOTAL	**46**	**100.0**

The effects of the load carriage condition on foot blisters are summarized in Table 5. A

majority of the friction blisters were observed with the heavy load at both medium and fast speeds.

TABLE 5. Influence of load carriage conditions on foot blisters.

CONDITIONS	NO. OF INJURIES	PERCENT
1. 5.2 kg, 3.96 km/hr	0	0.0%
2. 5.2 kg, 4.86 km/hr	1	4.2%
3. 5.2 kg, 5.76 km/hr	2	8.3%
4. 31.5 kg, 3.96 km/hr	2	8.3%
5. 31.5 kg, 4.86 km/hr	3	12.5%
6. 31.5 kg, 5.76 km/hr	1	4.2%
7. 49.4 kg, 3.96 km/hr	0	0.0%
8. 49.4 kg, 4.86 km/hr	7	29.2%
9. 49.4 kg, 5.76 km/hr	8	33.3%
TOTAL	**24**	**100.0**

The effect of the various conditions on upper back strain is shown in Table 6. The frequency of upper back strain was highest with the heaviest load during fast, medium and slow speeds.

TABLE 6. Influence of load carriage conditions on upper back strain.

CONDITIONS	NO. OF INJURIES	PERCENT
1. 5.2 kg, 3.96 km/hr	0	0.0%
2. 5.2 kg, 4.86 km/hr	0	0.0%
3. 5.2 kg, 5.76 km/hr	0	0.0%
4. 31.5 kg, 3.96 km/hr	0	0.0%
5. 31.5 kg, 4.86 km/hr	2	10.5%
6. 31.5 kg, 5.76 km/hr	2	10.5%
7. 49.4 kg, 3.96 km/hr	6	31.6%
8. 49.4 kg, 4.86 km/hr	6	31.6%
9. 49.4 kg, 5.76 km/hr	3	15.8%
TOTAL	**19**	**100.0**

Table 7 shows the influence of the load carriage conditions on the frequency of shoulder injuries. The majority of shoulder injuries occurred with the heaviest load at both slow and fast speeds. Two cases of upper extremity numbness were reported at the medium and heavy loads at medium speeds. The symptoms resolved when the packs were removed.

Table 7. Influence of load carriage conditions on shoulder injuries.

CONDITIONS	NO. OF INJURIES	PERCENT
1. 5.2 kg, 3.96 km/hr	0	0.0%
2. 5.2 kg, 4.86 km/hr	0	0.0%
3. 5.2 kg, 5.76 km/hr	0	0.0%
4. 31.5 kg,3.96 km/hr	0	0.0%
5. 31.5 kg, 4.86 km/hr	1	12.5%
6. 31.5 kg, 5.76 km/hr	0	0.0%
7. 49.4 kg, 3.96 km/hr	2	25.0%
8. 49.4 kg, 4.86 km/hr	1	12.5%
9. 49.4 kg, 5.76 km/hr	4	50.0%
TOTAL	**8**	**100.0**

DISCUSSION

The purpose of this study was to document the types and incidence rates of injuries occurring during a prolonged treadmill march, carrying various loads at different speeds. The authors also wanted to examine the effects of certain variables (speed, weight) on changes in foot anthropometry.

The injuries predominantly involved the lower extremities and back. Foot blisters were the most common injury recorded and this has been observed in field loaded roadmarches (2,3,4). Blisters can debilitate the soldier and lead to complications of infection and cellulitis (13). Friction blisters are due to frictional shearing forces that are applied to the epidermis of the skin (13,14). Moist feet can influence the time required for blistering by effecting the coefficient of friction for the skin (13). The standard Army practice of using foot powder and undergoing frequent sock changes are measures that have been utilized to prevent blisters. Other preventive measures such as wearing an inner polypropylene or nylon sock have also

been reported to keep the feet dry by wicking away foot moisture (15,16). Reynolds, et al (17) reported that antiperspirants may be a helpful measure in reducing the frequency of blisters. Perhaps using special products to keep the feet dry would have resulted in a lower incidence of blisters in the present study.

The second most common site of injury in this study was the back (20%) which was higher than found in other studies (2,3). Differences could be attributed to the small sample size and the fact that the subjects carried heavier loads. Results showed that the highest number of back injuries occurred with the heaviest load. It has been shown that during treadmill walking, the rucksack is not in synchrony with the movements of the trunk muscles. The muscles must compensate for this asynchrony and over a period of time this leads to fatigue and injury (18). Also, trunk angle and vertical forces increase as the load is increased which results in more stress on the back muscles (19).

The most common type of injury involving the back was upper back strain. Electromyographic studies (20) reveal that the activity in the upper back muscles is higher when the pack is placed high on the back as was the case in this study. If these muscles were not conditioned for loadcarriage then fatigue and injury might be expected to occur.

The shoulder was the third most common injury site with two cases presenting as a transient rucksack palsy. Other authors have reported this injury during load carriage marches and the shoulder girdle and elbow flexors are the most common sites affected. Reported symptoms include paresthesias, numbness and weakness secondary to compression of the upper trunk of the brachial plexus (6,21). Factors contributing to this disorder include using rucksacks without a frame or hipbelt, and carrying heavy packs (6). The subjects in this study used frames and hip belts. However, the two cases of rucksack palsy did occur with the heavier loads. Symptoms decreased when the pack was adjusted and completely resolved when the pack was removed.

In the present study, we documented one stress fracture by xray and four cases of metatarsal pain. It was difficult to determine whether the stress fracture was related to the marching, to off duty activities (basketball), or to accumulative stresses from both activities. Stress fractures and metatarsal pain have been associated with loaded marching especially in troops undergoing initial military training (22,23). Knapik, et al (3) also reported metatarsal pain during a 20 km loaded road march conducted with light infantry soldiers. Several factors shown to be associated with foot i: iuries are low fitness level (23,24), excess body weight (24), long march distances (25), ar. type of training activities (26). In the present study, a large percentage of the foot injuries were noted with the heavier loads. Kinoshita (27) found that heavier loads led to foot rotation that exposed the distal end of the metatarsals to

mechanical stresses for a longer period of time. The author recommended that altering stride length and wearing flexible boots might decrease the forces of stress in this area. Cushion insoles have also been recommended to decrease these stresses (15) but other sources report contradictory findings (28). This study did not examine this issue.

Foot anthropometric measurements were performed in this study to determine if foot dimensions change during loaded marching. Freedman, et al (8) reported that the dimensions of the feet did not change significantly during prolonged marching with weights for 13.7 miles/day for 32 days. However, the subjects were tested in Army dress shoes and carried 20 lb weights in their hands. In contrast, Cooper (4) noted an increase in foot girth as high as 9 mm in 49 % of soldiers participating in a 56km night march while carrying a rifle and water bottle. In the present study, significant pre to post march changes were noted with heel breadth measurements and ball of foot, instep and ankle circumferences. However, the maximum changes were not as high as in Cooper's study.

The significant heel breadth changes did not show a clear relationship to march speed or load. Any changes in pre to post measurements were probably related to changes in gait during the different conditions.

Ankle circumference changes occurred in all but one condition. There was a tendency for the significant changes in ball of foot and instep circumferences to occur with the heavier loads. However, more extensive analysis revealed that these changes were not significant. Therefore, the circumference increases could have been related to the marching and not to the load weight. Foot venous capacitance increases have been noted during weightbearing exercise. Armstrong and Kenney (29) reported significant foot venous capacitance increases with strain gauge plethysmography before and after an 8 week running program.

Foot anthropometric changes were not significantly affected by speed in this study. However, it would be interesting to see the effect of march speed on foot girth over longer distances.

In summary, this study documented a large number of minor injuries among physically fit soldiers marching on a treadmill at various speeds and over a long distance with heavy loads. Also, there was a tendency for certain foot anthropometric changes to occur with the heavier loads and the association of load and speed to foot girth changes during marching needs further evaluation. There are still many unanswered questions about the nature and causes of injuries specifically related to loaded road marches. Additional laboratory and field research studies need to be conducted so that preventive strategies can be developed to minimize injuries. This would have a beneficial effect on both unit strength and combat readiness.

CONCLUSIONS

1. Load carriage injuries occurring during a prolonged treadmill march primarily involve the lower extremities and back.

2. Foot blisters were the most common injury recorded.

3. The standard Army practice of using foot powder and undergoing frequent sock changes does not prevent blister formation during prolonged treadmill marches.

4. The most common type of back injury was upper back strain.

5. Transient rucksack palsy can occur when carrying a heavy load on a treadmill for an extended period of time.

6. Marching on a treadmill over a prolonged period will significantly increase the circumference of the foot.

7. Treadmill load carriage march injuries are similar to actual field loaded road march injuries.

RECOMMENDATIONS

1. The standard Army practice of preparing the feet prior to a road march needs to be systomically reevaluated and updated.

2. Adequate planning is necessary before participating in a prolonged loaded march and unit leaders should consider several factors (footwear, load weight and distribution, etc.) during the preparation phase.

3. The sizing of bootwear for the soldier needs further evaluation to determine the relationship of these factors to the occurrence of foot blisters.

4. Anatomical and biomechanical factors play an important role in loaded marching and should be carefully considered in order to prevent injuries.

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APPENDIX
DATA FORM USED TO RECORD INJURIES

INJURY DATA ENTRY FORM

DATE ___/___/__

SUBJECT NO.____________

STUDY TITLE_________

____

NAME ____________________________

LAST FIRST MI

INVESTIGATOR_________

RACE______ SEX- F__YES__NO M__YES__NO

SSN#______-________-_______

TREADMILL- PRE [__] POST [__] FOLLOWUP [___]

MARCH TIME ______MIN.

MARCH PACE _____KM/HR

RUCKSACK TYPE- ALICE YES [__] NO [__]

STANDARD HIPBELT USED? YES [___] NO [___]

LBE TYPE STANDARD [__] VEST [___] OTHER [____________]

RUCKSACK WEIGHT _________KG (TOTAL INCLUD. LBE + HELMET)

<u>DID AN INJURY OCCUR?</u>

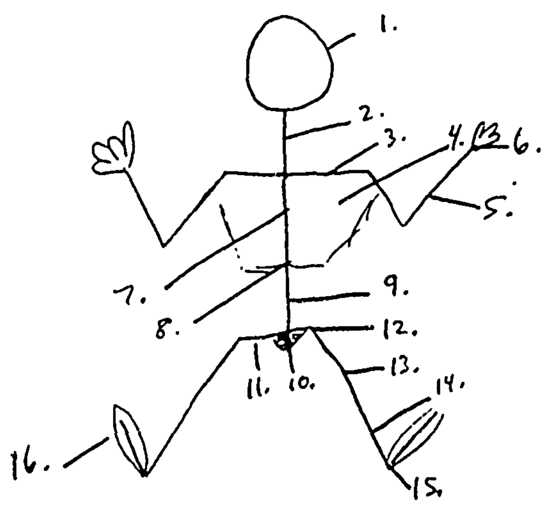
YES [___] NO [___]

IF YES, THEN COMPLETE THE FOLLOWING:

PLEASE SPECIFY DATE OF ACTUAL OCCURRENCE OF INJURY IF IT DIFFERS FROM THAT ON PAGE ONE.

DATE ____/____/____

LOCATION- 1. HEAD 2. NECK 3. SHOULDERS 4. CHEST 5. ARMS 6. HANDS 7. UPPER
(PLEASE) BACK 8. MID BACK 9. LOWER BACK 10. SACRUM 11. PELVIS 12. HIPS
(CIRCLE) 13. THIGHS 14. LEGS 15. ANKLES 16. FEET 17. OTHER ____________



BODY SIDE OF INJURY -RIGHT ____YES ___NO LEFT____YES___NO

SIGNS/SYMPTOMS YES [__] NO [__]

IF YES, WHAT WERE THEY?

1. TENDERNESS___YES___NO

2. LIMITED ROM OF JOINT___YES___NO

3. INFLAMMED JOINT (WARMTH OR ERYTHEMA OR SWELLING)

___YES___NO

4. DECREASED SENSATION BY PINPRICK ___YES___NO

5. TINGLING___YES___NO

6. MUSCLE SPASM__YES___NO

7. WEAKNESS___YES___NO

8. SKIN ABRASION___YES___NO

9. CONTACT RASH____YES___NO

10.SKIN INFECTION___YES___NO

11. BLISTER___YES___NO

12. BLACK TOENAIL___YES___NO

13. TORN TOENAIL___YES___NO

14. ATHLETES FEET____YES___NO

15. OTHER____________________

DIAGNOSIS____

____

XRAY ___YES ___NO IF YES, THEN WHAT TYPE? ____PLAIN XRAY _____________RESULTS

____BONE SCAN______________RESULTS

________________OTHER(SPECIFY)

________________________RESULTS

TREATMENT 1.__________________

2.__________________

3.__________________

4.__________________

DISPOSITION

LIMITATIONS YES [__] NO [__]   IF YES, THEN [__] UPPER BODY   HOW LONG? _____

[___]MID BODY   HOW LONG ?______

[___]LOWER BODY   HOW LONG?______

OTHER__________________________

QUARTERS YES[__] NO {___]   IF YES, HOW LONG ____________HRS

HOSPITAL YES [__] NO [___]   IF YES , HOW LONG____________DAYS

OTHER _________________________________

WHEN DID SUBJECT RETURN TO THE STUDY?___________

FULL PARTICIPATION___YES___NO

IF NO, THEN PLACE DATE WHEN THEY ACTUALLY RETURNED TO FULL PARTICIPATION.

_____/_____/_____   IF NEVER THEN STATE REASON_________________

_________________________.

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United Kingdom

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